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SEVEN NEW SPECTROSCOPIC BINARIES.

Observations made with the Mills spectrograph in the course of the regular observing programme show that the following stars have variable velocities in the line of sight.

1 *Geminorum* ($\alpha = 5^h 58^m.0$; $\delta = +23^\circ 16'$).

The spectrum is type H. Measures of four plates taken in 1903, 1905, and 1906 give a total range of about 8^{km} . The variation in its radial velocity was discovered by Mr. MOORE.

B. A. C. 5890 = D. C. 7579 ($\alpha = 17^h 21^m.3$; $\delta = -5^\circ 0'$).

The star is an F type, with broad lines. Both spectra are visible. The ratio of their intensities is about two to one, although the behavior of all lines is not the same in this respect. Its period is probably short. The variable velocity and doubling of spectrum were discovered by Mr. BURNS. From his observations of the variations from coincidence of the two spectra it seems probable that the masses of the two stars are not very different.

δ *Sagittæ* ($\alpha = 19^h 42^m.9$; $\delta = +18^\circ 17'$).

The spectral type is M. The observed range of velocities is about 14^{km} . Its binary character was suspected by Mr. CAMPBELL in 1901 and confirmed by the recent measures.

σ^2 *Cygni* ($\alpha = 20^h 12^m.3$; $\delta = +47^\circ 24'$).

Its spectrum is of the H type. The measures of four plates (two taken in 1905, and two in 1906) give a total range of 30^{km} . The variable velocity was discovered by Mr. BURNS.

ϵ *Cygni* ($\alpha = 20^h 42^m.1$; $\delta = +33^\circ 36'$).

This is a K-type star. The total variation in velocity from seven plates (1896-1906) is about 7^{km} . Its period is probably several years. Its binary character was suspected by Mr. H. D. CURTIS in 1903 and confirmed by the recent measures of Mr. BURNS.

ζ *Cygni* ($\alpha = 21^h 8^m.7$; $\delta = +29^\circ 49'$).

This star is of the K type. Seven plates (1896-1906) give a total range of 7^{km} . The variable radial velocity was shown by the measures of Messrs. STEBBINS and BURNS.

ι Capricorni ($\alpha = 21^h 16^m.7$; $\delta = -17^\circ 15'$).

The spectrum is H type. The total range in-velocity for six plates (1900-1906) is about 9^{km} . Its variable velocity was suspected by Mr. MOORE from the third plate and confirmed by recent measures.

W. W. CAMPBELL.

LICK OBSERVATORY, November 12, 1906.

J. H. MOORE.

NOTE ON SOME SIMPLIFICATIONS IN THE REDUCTION OF
STELLAR PHOTOGRAPHS.

A number of accurate methods for the reduction of measures of star photographs exist. Some of these methods require *four* plate-constants to be determined, whereas in others it is necessary to derive *six* constants.

In satellite and asteroid work, where only one or two places are to be derived from each plate, the labor of obtaining these constants is relatively great. This consideration, together with the rapidly increasing number of places which are derived photographically, makes it desirable to simplify the processes as much as possible.

To obtain the accurate position of a star on a plate, four constants, besides a knowledge of the refraction, are necessary, viz. :—

Scale value,

Orientation, and

The right ascension and declination of the center of the plate.

Values for these constants, as near the true ones as possible, are usually assumed and corrections obtained by a least-square adjustment of the residuals derived from a comparison with catalogue stars.

If, instead of taking an *arbitrary* plate-center, we take the *center of gravity* of our *system of comparison-stars*, the corrections to the center become zero, and we have but *two* unknown quantities to determine.

To obtain the rigorously accurate center it is only necessary to apply the mean of the *proper curvature corrections* to the mean of the right ascensions and declinations of the comparison-stars.

The adoption of the above center shortens the solution for the remaining two constants by reducing some of the coeffi-